PERSONAL
INFORMATION

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RESEARCH
INTERESTS

Capillary trapping of supercritical CO2 in pore scale
- experimental study of residual trapping supercritical CO2 in high temperature and high pressure in micromodel
- direct numerical simulations of the full Navier–Stokes equations for the CO2/Brine immiscible flow processes

Coupled poromechanics and multiphase flow in unsaturated soils
- the development of coupled hydromechanical constitutive model for unsaturated soils
- the development of computer code for modeling the coupled two-phase fluid flow and elastoplastic deformation in unsaturated soils

Performances and assessments of seepage control in fractured/porous media
- the development of a robust and effective numerical method for modeling steady / nonsteady/unsaturated flow in fractured/porous media with complex seepage control systems

EDUCATION

Ph.D. in Geomechanics and Geotechnical Engineering (6/2013),   Wuhan University

- Dissertation Title: *A fully coupled hydromechanical model for unsaturated soils and its numerical simulations* [link]
- Advisor: Dr. Yifeng Chen & Prof. Chuangbing Zhou

Visiting PhD student (7/2011–7/2012),   Lawrence Berkeley National Laboratory

- Research Topic: Coupled hydromechanical processes in unsaturated soils
- Advisor: Dr. Hui-Hai Liu

B.S. in Water Resources and Hydropower Engineering (6/2008),   Wuhan University

- Thesis: *Seepage analysis and control of 300m high core rock-fill dam in Shuangjiangkou hydropower project*

WORK
EXPERIENCE

Lecturer (9/2013–present),   Wuhan University

- Teaching Courses: *Engineering Geology, Hydrogeology, Soil Mechanics*

Guest PostDoc (3/2015–present),   Lawrence Berkeley National Laboratory

- Advisor: Dr. Jiamin Wan & Dr. Tetsu K. Tokunaga

SELECTED
AWARDS

- The First prize for scientific and technological progress in Hubei province (the 9th contributor), China, 2012
- The First prize in Academic Innovation Award of graduate students in Wuhan University, 2012
- The scholarship of Chinese Academy of Sciences, 2012

GRANTS
- **PI**, *National Science of Foundation of China (NSFC)* , (No. 51409198), 2015-2017 (CNY 260,000)
- **PI**, *China Postdoctoral Science Special Foundation*, 2015-2017 (CNY 150,000)
- **PI**, *China Postdoctoral Science Foundation*, (No. 2014M552081), 2014-2015 (CNY 50,000)
- **PI**, *Open Research Fund of State Key Laboratory of Geomechanics and Geotechnical Engineering*, (No. Z013004), 2014-2015 (CNY 100,000)
- **PI**, *Fundamental Research Funds for the Central Universities*, (No. 2042014k-f0006), 2014-2015 (CNY 100,000)

SOFTWARE SKILLS

Skilled Programming Languages
- C/C++/C#, FORTRAN

Skilled Softwares
- MATLAB, COMSOL, OPENFOAM, ABAQUS, ANSYS

Software Developments
- Independent development, the 3D finite element code for fully solid-water-air coupling in porous media (WHUSWA^{3D})
- Independent development, the 3D finite element code for saturated-unsaturated flow problems with complex boundary conditions (WHUFLOW^{3D})
- Cooperative development, the 3D finite element code for steady-nonsteady seepage flow with complex seepage control systems (WHUSEEP^{3D})

Software Registrations
- The second contributor, the FE analysis system for coupled hydro-mechanical processes in geomaterials (THYME^{3D}), Registration No. 0519964.
- The second contributor, the reliability analysis system in slope engineering (WHUREL), Registration No. 0245990.
- The second contributor, the structural reliability system of stochastic response surface method (WHUSRSM), Registration No. 0519964.

PAPER IN REVIEW

[1] **Hu, R.**, Chen, Y. F., Liu, H. H., Zhou, C. B. (2015). A numerical formulation with unified unilateral boundary condition for unsaturated flow problems in porous media. *Acta Geotechnica*, In Review

PEER-REVIEWED JOURNAL PUBLICATIONS

[2] **Hu, R.**, Chen, Y. F., Liu, H. H., Zhou, C. B. (2015). A coupled two-phase fluid flow and elastoplastic deformation model for unsaturated soils: Theory, implementation and application. *International Journal for Numerical and Analytical Methods in Geomechanics*, In Press.

[3] **Hu, R.**, Chen, Y. F., Liu, H. H., Zhou, C. B. (2015). A relative permeability model for deformable soils and its impact on coupled unsaturated flow and elasto-plastic deformation processes. *Science China Technological Sciences*, In Press.

[4] Chen, Y. F., Zhou, J. Q., Hu, S. H., **Hu, R.**, Zhou, C. B. (2015). Evaluation of Forchheimer equation coefficients for non-Darcy flow in deformable rough-walled fractures. *Journal of Hydrology*, doi:10.1016/j.jhydrol.2015.09.021. [link]

[5] **Hu, R.**, Chen, Y. F., Liu, H. H., Zhou, C. B. (2015). A coupled stress-strain and hydraulic hysteresis model for unsaturated soils: thermodynamic analysis and model evaluation. *Computers and Geotechnics*, 63: 159-170. [link]

[6] Chen, Y., Zhou, S., **Hu, R.**, Zhou, C. B. (2015). A homogenization-based model for estimating effective thermal conductivity of unsaturated compacted bentonites. *International Journal of Heat and Mass Transfer*, 83: 731-740.[link]

[7] Chen, Y. F., Hu, S. H., **Hu, R.**, Zhou, C. B. (2015). Estimating hydraulic conductivity of fractured rocks from high-pressure packer tests with an Izbash law-based empirical model. *Water Resources Research*, 51(4), 2096-2118.[link]

[8] Wang, M., Chen, Y. F., **Hu, R.**, Liu, W., ZHou, C. B. (2015). Coupled hydro-mechanical analysis of a dam foundation with thick fluvial deposits: A case study of the Danba Hydropower Project, Southwestern China. *European Journal of Environmental and Civil Engineering*, doi:10.1080/19648189.2015.1013639. [link]

[9] **Hu, R.**, Liu, H. H., Chen, Y. F., Zhou, C. B. (2014). A constitutive model for unsaturated soils with consideration of inter-particle bonding. *Computers and Geotechnics*, 59: 127-144. [link]

[10] Chen, Y. F., Zhou, S., **Hu, R.**, Zhou, C. B. (2014). Estimating effective thermal conductivity of unsaturated bentonites with consideration of coupled thermo-hydro-mechanical effects, *International Journal of Heat and Mass Transfer*, 72: 656-667. [link]

[11] **Hu, R.**, Chen, Y. F., Liu, H. H., Zhou, C. B. (2013). A water retention curve and unsaturated hydraulic conductivity model for deformable soils: consideration of the change in pore size distribution. *Géotechnique*, 63(16): 1389-1405. [link]

[12] **Hu, R.**, Chen, Y. F., Zhou, C. B. (2011). Modeling of coupled deformation, water flow and gas transport in soil slopes subjected to rain infiltration. *Science China Technological Sciences*, 54(10): 2561-2575. [link]

[13] Chen, Y. F., **Hu, R.**, Zhou, C. B., Li, D. Q., Rong, G. (2011). A new parabolic variational inequality formulation of Signorini's condition for non-steady seepage problems with complex seepage control systems. *International Journal for Numerical and Analytical Methods in Geomechanics*, 35(9): 1034-1058. [link]

[14] Chen, Y. F., **Hu, R.**, Lu, W. B., Li, D. Q., Zhou, C. B. (2011). Modeling coupled processes of non-steady seepageflow and non-linear deformation for a concrete-faced rockfall dam. *Computers and Structures*, 89(13-14): 1333-1351. [link]

[15] Chen, Y. F., Zhou, S., **Hu, R.**, Zhou, C. B. (2014). Estimating effective thermal conductivity of unsaturated bentonites with consideration of coupled thermo-hydro-mechanical effects. *International Journal of Heat and Mass Transfer*, 72: 656-667. [link]

[16] Chen, Y. F., **Hu, R.**, Zhou, C. B., Li, D. Q., Rong, G., Jiang, Q. H. (2010). A new classification of seepage control mechanisms in geotechnical engineering. *Journal of Rock Mechanics and Geotechnical Engineering*, 2(3): 209-222. [link]

[17] Li, Y., Chen, Y. F., Jiang, Q. H., **Hu, R.**, Zhou, C. B. (2014). Performance assessment and optimization of seepage control system: a numerical case study for Kala underground powerhouse. *Computers and Geotechnics*, 55: 306-315. [link]

[18] **Hu, R.**, Chen, Y. F., Zhou, C. B. (2013). A water retention curve model for deformable soils based on pore size distribution. Chinese Journal of Rock Mechanics and Engineering, 35(8): 1451-1462. (in Chinese) [link]

[19] **Hu, R.**, Chen, Y. F., Zhou, C. B. (2013). A relative hydraulic conductivity model for unsaturated deformable soils. Chinese Journal of Rock Mechanics and Engineering, 32(6): 1279-1287. (in Chinese) [link]

[20] **Hu, R.**, Li, D. Q., Zhou, C. B., Chen, Y. F. (2010). Structural reliability analysis using stochastic response surface method. Engineering Mechanics, 9: 192-200. (in Chinese) [link]

[21] **Hu, R.**, Chen, Y. F., Li, D. Q., Zhou, C. B., Tang, X. S. (2012). Reliability analysis of seepage stability of core-wall rockfill dam based on stochastic response surface method. Rock and Soil Mechanics, 33(4): 1051-1060. (in Chinese) [link]

[22] **Hu, R.**, Chen, Y. F., Zhou, C. B., Li, D. Q. (2011). A variational inequality approach for non-steady seepage problems and its application in engineering practices. Chinese Journal of Hydrodynamics, 26(2): 239-251. (in Chinese) [link]

[23] Chen, Y. F., **Hu, R.**, Zhou, C. B., Jing, L. (2013). A micromechanical damage model for crystalline rocks subjected to coupled thermo-hydro-mechanical loading. Chinese Journal of Rock Mechanics and Engineering, 32(11): 2185-2195. (in Chinese)[link]

[24] Chen, Y. F., **Hu, R.**, Zhou, S., Zhou, W., Zhou, C. B. (2011). Coupled hydrome-chanical model for high concrete-faced rockfill dams and its application. Chinese Journal of Geotechnical Engineering, 33(9):1340-1347. (in Chinese) [link]

[25] Wu, S. B., **Hu, R.**, Li, D. Q. (2009). Reliability sensitivity analysis of main beams for hydraulic gates using adaptive importance sampling method. Engineering Journal of Wuhan University, 1: 20-24. (in Chinese) [link]

[26] Chen, Y. F., Zhou, C. B., **Hu, R.**, Li, D. Q., Rong, G. (2010). Key issues on seepage flow analysis in large scale hydropower projects. Chinese Journal of Geotechnical Engineering, 32(9): 1448-1454. (in Chinese) [link]

[27] Bai, Z. X., Chen, Y. F., **Hu, R.**, Zhang, Q., Zhou, C. B. (2012). Seepage flow test on drain sand flume and validation of variational inequality method of Signorini condition. Rock and Soil Mechanics, 33(9): 2829-2836. (in Chinese) [link]

[28] Li, D. Q., Zhou, C. B., **Hu, R.** (2009). System reliability analysis of rock slope wedge stability based on n-dimensional equivalent method. Chinese Journal of Rock Mechanics and Engineering, 28(7): 1415-1424. (in Chinese) [link]

[29] Chen, Y. F., Zhou, C. B., Mao, X. Y., **Hu, R.** (2010). Numerical simulation and assessment of seepage control effects on surrounding rocks of underground powerhouse in shuibuya hydropower project. Chinese Journal of Rock Mechanics and Engineering, 29(2): 308-318. (in Chinese) [link]

CONFERENCE PUBLICATIONS

[30] **Hu, R.**, Chen, Y. F., Zhou, C. B. (2012). Effects of fluid flow, soil deformation and horizontal drains on soil slope stability subjected to rain infiltration. Landslides and Engineered Slopes, *Protecting Society through Improved Understanding. 11th International and 2nd North American Symposium on Landslides*, London, Taylor & Francis Group, Vol. 2, pp. 1601-1607. [[link]